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Case Report

Intramuscular myxoma with fibrous dysplasia: A report of two cases with a review of the literature

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Two cases are reported of a rare association of intramuscular myxoma with fibrous dysplasia in a 70 and 40 year old Japanese woman, respectively. One of them had a solitary intramuscular myxoma, and the other patient suffered from two intramuscular tumors that had been initially misdiagnosed as myxoid liposarcoma. Only 24 cases of this kind of association have been recorded in the literature. This association should be taken into consideration to avoid inappropriate treatment, when cases of myxoid soft tissue tumor with a bone lesion are encountered.

Key words: fibrous dysplasia, intramuscular myxoma, soft tissue tumor

Since 1926, when Henschen presented a case of osteitis fibrosa with multiple intramuscular myxoma, the association has been sporadically reported.[1–21] The soft tissue myxomas may be misinterpreted as malignant tumors, such as myxoid liposarcoma and myxoid malignant fibrous histiocytoma, because of the multiple, intramuscular, large tumors and the associated bone lesion.

We report here two additional patients with intramuscular myxomas associated with fibrous dysplasia, and analyze their clinicopathologic features with those of 24 cases from the literature.

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CLINICAL SUMMARY

Case 1

A 70 year old woman having had a bone lesion diagnosed as fibrous dysplasia of the bilateral femurs and pelvic bones at the age of 37 years, noticed a painless mass in the right thigh when she was 67 years old. An X-ray film demonstrated multiple radiolucent areas interpreted as fibrous dysplasia in the bilateral pelvic bones and femurs with portions that had increased in radiodensity due to bone grafting in the bilateral proximal femurs (Fig. 1a). Computed tomography also revealed a well circumscribed, homogeneous low density mass in the right great adductor muscle (Fig. 1b).

Simple excision of the soft tissue tumor was performed. The tumor was located within the muscle and measured $4 \times 3.5 \times 3$ cm in diameter.

Three years later, another painless mass on the anterior aspect of the left thigh was detected and excised. This tumor was located in the rectus femoris muscle, measuring 2×3 cm in diameter. The initial diagnosis of the second tumor was metastatic myxoid liposarcoma, although the first one had been correctly diagnosed. The patient had no cutaneous lesions or endocrinopathy.

Case 2

A 46 year old woman had a painless mass of 2 months duration in the lateral side of the right thigh. An X-ray film demonstrated multiple radiolucent areas throughout the femur and in the right pelvic bones, with a 'ground glass' appearance typical of fibrous dysplasia (Fig. 2a,b). Computed tomography revealed a rounded intramuscular mass with homogeneous

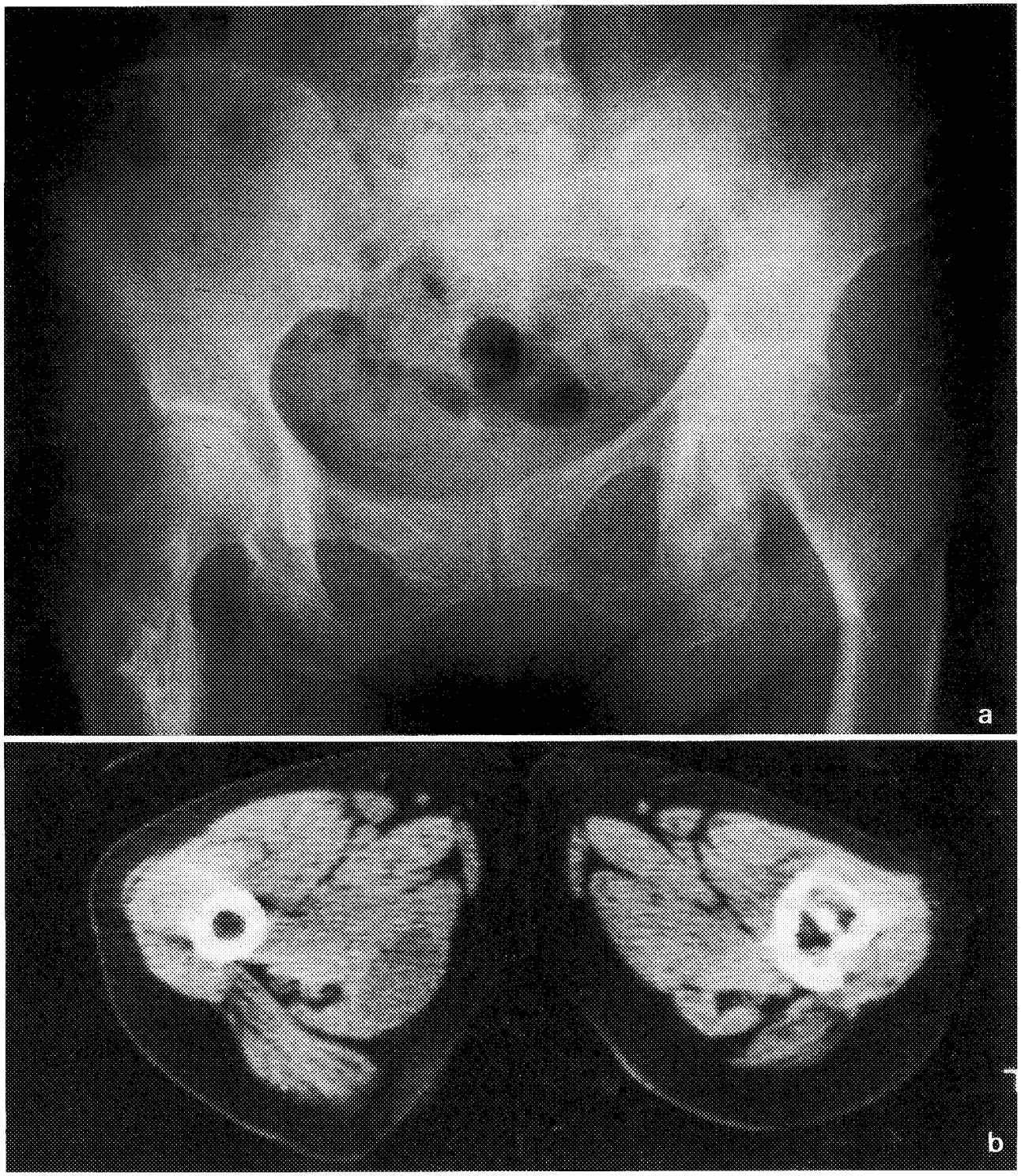

Figure 1 (**a**) Multiple radiolucent areas interpreted as fibrous dysplasia in the bilateral proximal femurs and pelvic bones. (**b**) Computerized tomography reveals a well circumscribed, homogeneous low density mass in the right great adductor muscle.

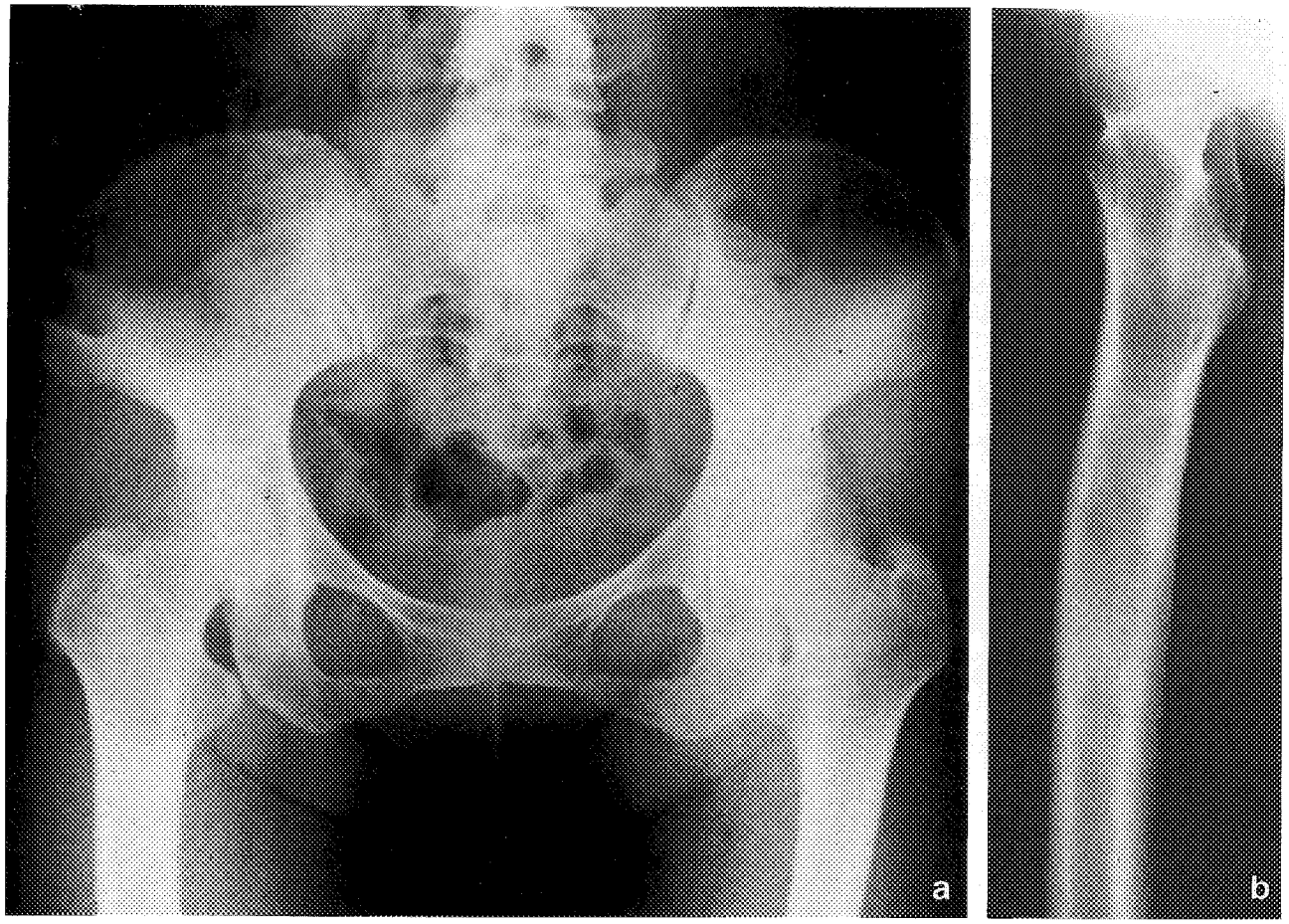

Figure 2 (**a**,**b**) Multiple radiolucent areas throughout the femur and in the right pelvic bones, showing a 'ground glass' appearance typical of fibrous dysplasia.

low density (Fig. 2c), and angiography indicated that the mass was hypovascular. Both axial and coronal magnetic resonance (MR) scans revealed that the mass was homogeneous hypointense to the muscle on T1-weighting and markedly hyperintense and brighter than fat on T2-weighting (Fig. 2d,e). Contrast-enhanced images demonstrated an inhomogeneous increase in signal intensity (Fig. 2f). The pre-operative diagnosis of this recently encountered case was intramuscular myxoma associated with fibrous dysplasia.

The excised tumor located within the vastus lateralis muscle measured 2.5 × 3 × 3 cm in diameter. The patient was free of skin lesions or endocrinopathy.

PATHOLOGICAL FINDINGS

All three intramuscular tumors of the thigh in both cases exhibited essentially the same macroscopic and microscopic features.

Grossly, the tumors appeared well-circumscribed but not encapsulated. The cut surfaces were gray-white and had a gelatinous or mucoid appearance.

Histologically, the tumors were made up of a small number of inconspicuous cells embedded in a prominent mucoid matrix. The scattered cells consisted predominantly of spindle, oval or stellate cells with spindle or plump nuclei, many of which were hyperchromatic or pyknotic (Fig. 3). Vascular components were scanty, and no pericapillary cellular aggregates were noted. Mitotic figures of the tumor cells were absent. Surrounding skeletal muscle fibers that merged with the tumors were atrophic and occasionally were split up by an abundant mucoid matrix. The spindle or stellate cells in the tumors were negative with periodic acid-Schiff staining. The shape of these cells often appeared to be determined by the adjacent reticulin fibers. The mucoid material consisted mainly of acid mucopolysaccharides, and was almost completely removed by hyaluronidase digestion. Immunohistochemically, there were no tumor cells with a staining reaction for S-100 protein.

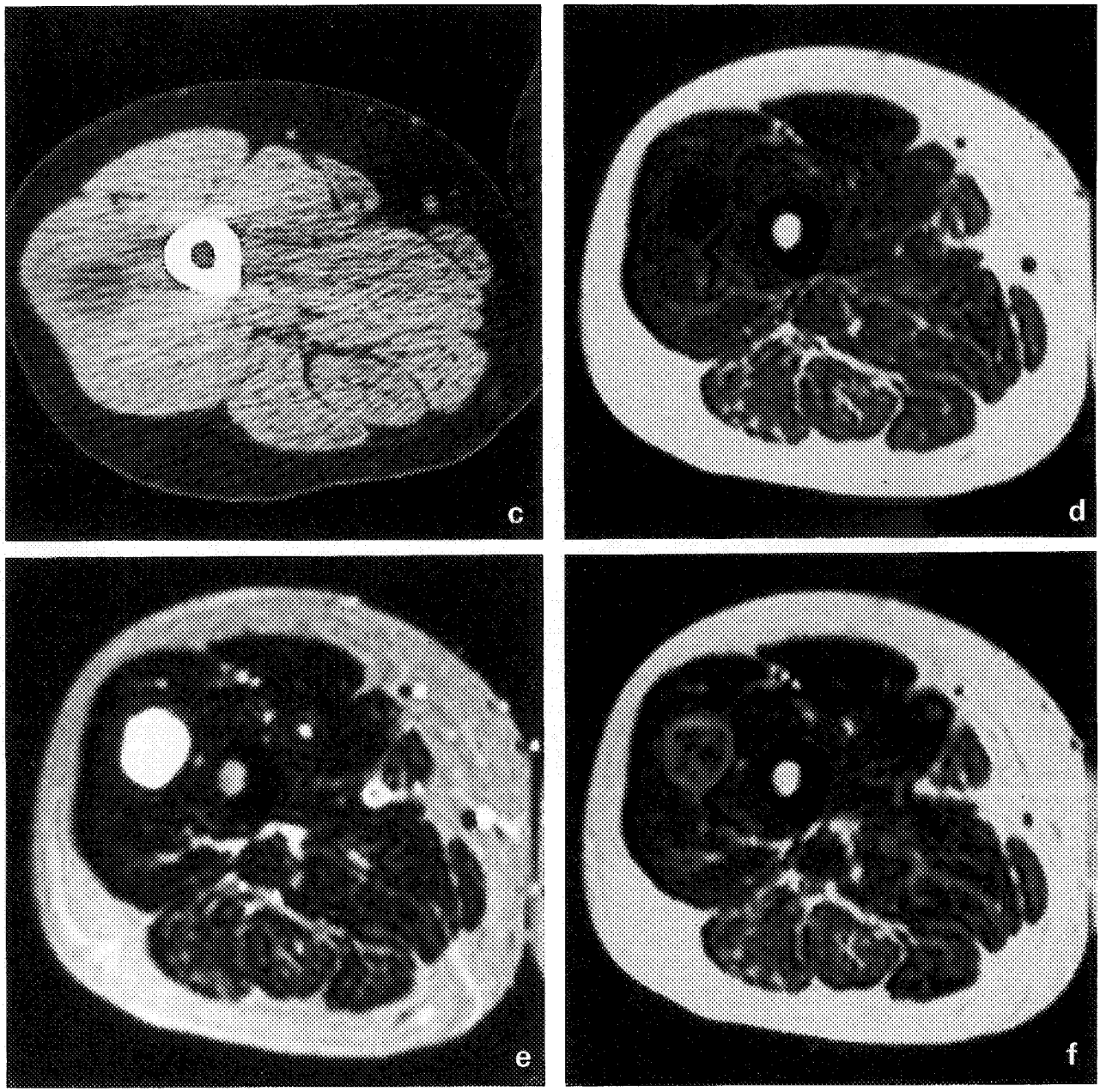

Figure 2 (**c**) Computerized tomography reveals a rounded intramuscular mass with homogeneous low density in the right vastus lateralis muscle. (**d**) Axial magnetic resonance scans demonstrate the mass with homogeneous hypointense to the muscle on T1-weighting and (**e**) markedly hyperintense, brighter than fat on T2-weighting. (**f**) Contrast-enhanced images exhibit an inhomogeneous increase in signal intensity.

DISCUSSION

Intramuscular myxoma is a relatively uncommon benign neoplasm of unknown origin, which has an abundant myxoid matrix as seen in the core of the umbilical cord of the mature fetus.[12]

Henschen presented the first description of the association of soft tissue myxoma with osteitis fibrosa in 1926.[1] To our knowledge, only 24 cases with such an association have been reported in the literature, and these are summarized in Table 1.[1-21] In such cases, several unique points are recognized when we compare them to cases without the associa-

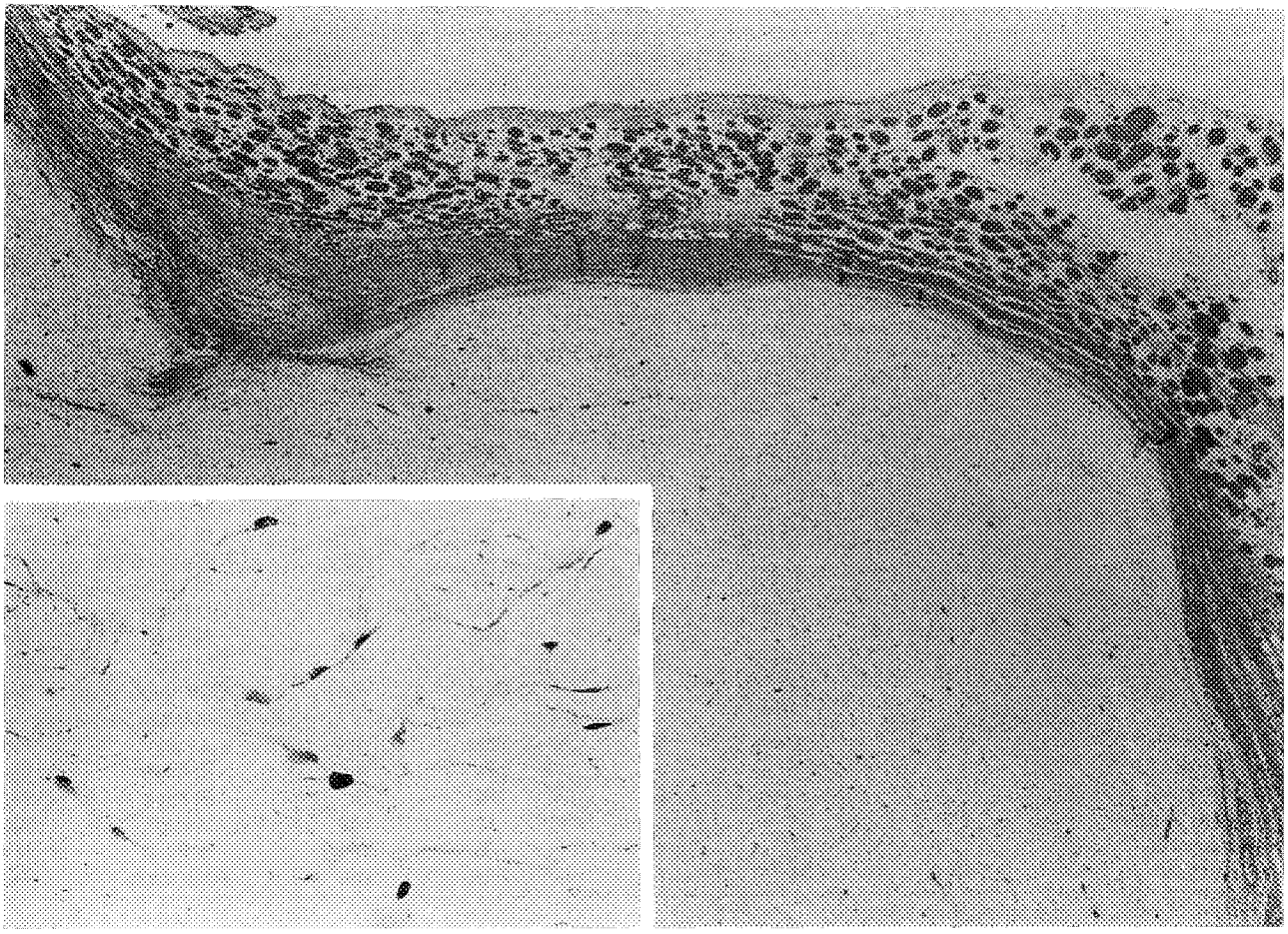

Figure 3 A low-power view of intramuscular myxoma showing the paucity of both constituent cells and vasculature, and an abundance of mucoid material. Inset: the constituent cells are composed predominantly of spindle, oval or stellate cells with hyperchromatic or pyknotic nuclei.

tion. Generally, the monostotic form of fibrous dysplasia is more common than the polyostotic form, while polyostotic fibrous dysplasia is found often in the cases with the association. Most intramuscular myxomas are solitary, but myxomas associated with fibrous dysplasia often occur as multiple tumors. Furthermore, myxomas in such association tended to be located in the vicinity of the bone lesion. One of our patients also had multiple myxomas with these features. In the 24 reported cases, six were associated with McCune–Albright syndrome.[13] However, no skin lesions or endocrine abnormalities were detected in our patients.

Because of the intramuscular location and large size, intramuscular myxoma may be misdiagnosed as a malignant lesion, particularly as a myxoid liposarcoma. Hypovascularity on the angiogram, a homogeneous appearance with low density determined by computed tomography, and homogeneous intensity on both T1- and T2-weighted MR images are helpful in prediction of myxomas.[22–25] Microscopically, unlike myxoid liposarcomas, intramuscular myxomas display hypocellularity with no plexiform capillary network or lipoblasts. Immunohistochemically, S-100 protein, confirmed to be present in the cytoplasm and nuclei of lipoblasts in most liposarcomas as well as Schwann cells,[26] is negative in myxoma cells.[24] Recognition of the distinction between intramuscular myxoma associated with fibrous dysplasia of bone and myxoid liposarcoma or other malignant myxoid lesions, such as myxoid malignant fibrous histiocytoma and extraskeletal myxoid chondrosarcoma, with bone involvements will prevent incorrect diagnosis and inappropriate treatment.

The association of intramuscular myxoma with fibrous dysplasia has been sporadically reported, but the explanation for the association has not been made clear. Wirth *et al.*

Table 1 Reported cases of intramuscular myxoma associated with skeletal fibrous dysplasia

Authors	Sex	Age when detected (years)		Area of involvement			
		Fibrous dysplasia	Myxoma	Fibrous dysplasia	Polyostotic	Myxoma	Multiple
Henschen (1926)[1]	F	Childhood	66	Rt thigh	Yes	Rt thigh	Yes
Krogius (1928)[2]	F	6	26	Bilat.	Yes	Rt thigh	Yes
Uehlinger (1940)[3]	M	11	67	Bilat.	Yes	Rt thigh	Yes
Braunwarth (1953)[4]	F	Not avail.	55	Lt	No	Lt	Yes
Mazabraud & Giard (1957)[5]	M	22	54	Rt	Yes	Rt	No
Heinemann & Woerth (1958)[6]	M	18	82	Rt	Yes	Rt	Yes
Laporte *et al.* (1961)[7]	F	12	24	Rt	Yes	Rt	Yes
Lick & Viehweger (1962)[8]	M	18	59	Bilat.	Yes	Rt	Yes
Mazabraud *et al.* (1967)[9]	F	Infancy	Not given	Rt	Yes	Rt	Yes
Wirth *et al.* (1971)[10]	M	3	17	Bilat.	Yes	Lt chest and arm	Yes
	M	20	33	Bilat	Yes	Rt buttock and thigh	Yes
Lejeune *et al.* (1972)[11]	M	Not given	42	Bilat.	Yes	Rt arm and buttock	Yes
Ireland *et al.* (1973)[12]	F	Not given	49	Lt	No	Rt arm Lt thigh	Yes
	F	Not given	61	Rt	Yes	Rt thigh	Yes
	F	23	28	Lt	Yes	Lt thigh and groin	Yes
Logel *et al.* (1976)[13]	F	Childhood	41	Rt	Yes	Rt trunk	Yes
Sedmak *et al.* (1983)[14]	M	Not given	50	Lt	Yes	Lt thigh	No
Witckin *et al.* (1986)[15]	M	15	41	Bilat.	Yes	Lt thigh	No
Blasier *et al.* (1986)[16]	F	Not given	57	Lt	Yes	Lt thigh	Yes
Biagini *et al.* (1987)[17]	F	10	42	Bilat.	Yes	Bilat. thigh Lt thigh	Yes
Glass-Royal *et al.* (1989)[18]	M	Not given	33	Bilat.	Yes	Lt arm	No
Sundaram *et al.* (1989)[19]	F	Not given	31	Rt	No	Rt thigh	No
Gianoutsos *et al.* (1990)[20]	M	Not given	53	Rt	No	Rt thigh	Yes
Goger *et al.* (1993)[21]	F	32	37	Lt	No	Lt thigh	Yes
Present case 1	F	46	46	Rt	Yes	Rt thigh	No
case 2	F	37	70	Bilat.	Yes	Bilat. thigh	Yes

F, female; M, male; Rt, right; Lt, left; Bilat., bilateral.

proposed the concept of a basic metabolic error of both tissues during the initial growth period.[10] Recent molecular studies have suggested that McCune–Albright syndrome is caused by a somatic mutation of the gene encoding the G protein.[27,28] The association may also be related to such a somatic mutation.

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